Space Weather Forecast

Issued on Monday, 04 April 2022 at 01:18 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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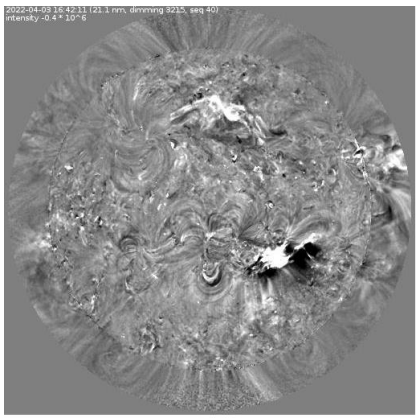
Space Weather Forecast Headline: Decreasing risk of Minor/Moderate radio blackouts. Possible Minor/Moderate Geomagnetic Storm from CME due midweek, detail TBC.

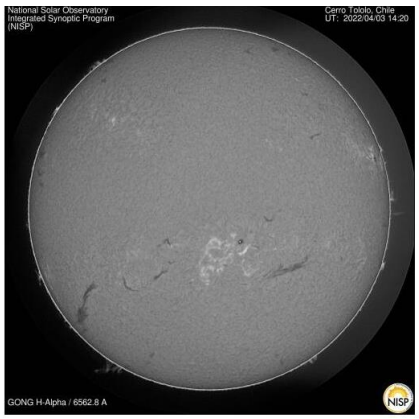
Analysis of Space Weather Activity over past 24 hours

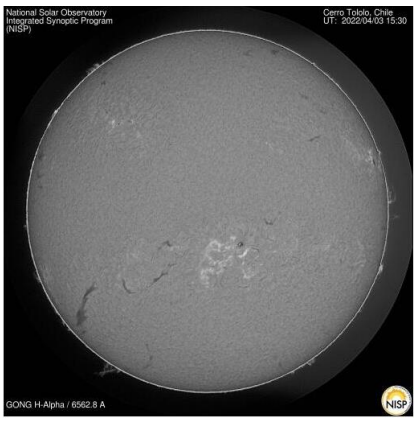
Solar Activity: Solar activity has been low over the past 24 hours, with the largest X-ray flare of the period a middling common-class flare observed at 03/1309UTC. This emanated from the vicinity of a large sunspot in the northwest of the sun near the western horizon. There are currently seven sunspot regions remaining on the sun, with the most active group of the past week now no longer visible on the very edge of the facing side. Detail in its immediate trailing groups is also likely to be hampered by the narrow viewing angle, however both now appear magnetically unipolar, which would suggest a declining risk of flares. There were a further three minor unipolar groups visible in the eastern solar hemisphere, with all of these stable and unremarkable. This left a pair of large but fading sunspot groups near the middle of the sun as the main surviving occupants.

There remain numerous large 'filaments' (arcs of plasma) on the sun. The most notable event of the 24 hours was the lifting off of the large south-centre filament mentioned in weekend guidance updates - at 03/1500UTC. This event was visible in satellite imagery and a cursory analysis has been conducted - an Earth-bound component is very likely, currently proposed using limited imagery as arriving within the UTC day of Wednesday 06 April. No other Coronal Mass Ejections (CMEs) were visible in available imagery.

Figure 1: Left: time-integrated extreme UV satellite imagery (courtesy of SIDC ROB) of the 'filament lift off' from 03/1500UTC (centre lower right). Also shown are ground-based observatory near-infra red images straddling the relevant time period, with the filament in question the dark stripe seen to disappear between the frames.







Solar Wind / Geomagnetic Activity: The solar wind showed a gradual decline in many measures

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in the period, perhaps indicating an exit from a fast wind and perhaps also residual CME effects. The solar wind speed fell from elevated to slightly elevated levels, before undergoing a step-wise increase to fully regain lost ground at 03/1500UTC. The cause of this resurgence is uncertain, however the effect on geomagnetic activity was slight. It is possible that this is related to a close pass from the 31 March moderate-class flare CME from the recent large sunspot that is now leaving the facing side, as this is indicated in MOSWOC modelling as passing the radius of the Earth's orbit around the sun at this time, narrowly ahead of Earth in its orbit.

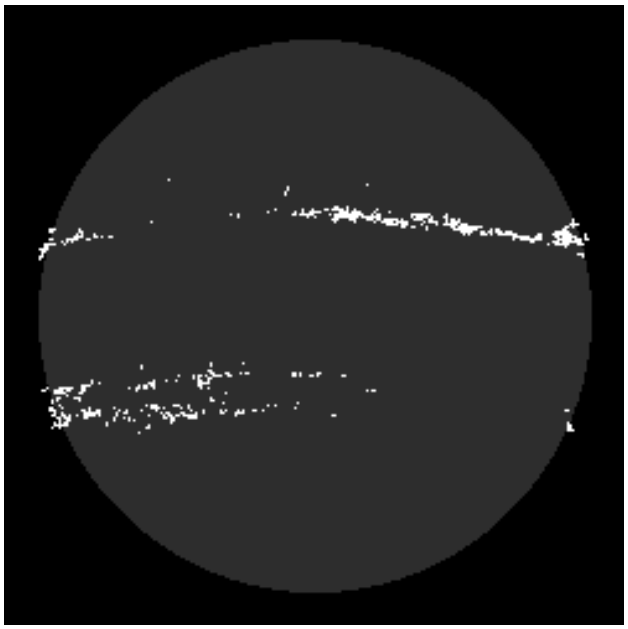
After the discontinuity in speed at 03/1500UTC, it again decreased back to slightly elevated levels. The number of particles comprising the solar wind and their associated magnetic field were both unremarkable and within typical background levels. The net result of the above solar wind measures was mainly quiet, well below Minor Storm G1 throughout.

Energetic Particles / Solar Radiation: Solar radiation showed a continuing gradual relaxation towards background levels, having reached S1/Minor Solar Radiation Storm prior to the 24-hour reporting period (at 02/1430UTC). This was in the wake of an moderate class X-ray flare from the northwest of the sun on Saturday 02 April.

Four-Day Space Weather Forecast Summary

Solar Activity: The chances of further significant flares should soon reduce into the new working week, as the northwestern sunspots leave the Earth-facing side. Activity should be predominantly low, with a much-reduced daily chance of moderate-class flares.

Figure 2: Point locations of all X-ray flares in the last two weeks – the dominant stripe in the northern solar hemisphere is the trail wrought by the previous most active sunspot group, with frequent common-class, as well as a handful of moderate and even a strong-class flare. This group has now crossed to the far side. Other honorable mentions go to a apir of surviving sunpots in the southern solar hemisphere, although these flares were confined to common-class, and they have become fewer in recent days (fading with rightward transit) as the groups' growth has stalled. Image courtesy of SIDC ROB.



Solar Wind / Geomagnetic Activity: An exit from the current fast wind is expected into the new working week, with no further 'coronal hole' fast wind forecast and mainly quiet activity. The

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03/1500UTC 'filament eruption' constitutes the only possible CME in the forecast, giving a peak risk of Minor/Moderate geomagnetic storm G1/G2 for the period on Wednesday 06 April.

Energetic Particles / Solar Radiation: The risk of further solar radiation storms should now slowly reduce as the northwestern sunspot regions rotate off the Earth-facing side of the sun.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	5	75	10
Strong	G3	No	1	1	10	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	40	25	25	25
Very Active	R3 to R5 X	No	10	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	15	10	10	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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